





PEPSI User's manual

Issue Date 1.1

October 23, 2020





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1 Revision History

Issue	Date	Changes	Responsible
1.0	$\begin{array}{c} 13.01.2020\\ 23.10.2020\end{array}$	First version	S. Järvinen
1.1		Changed facility status and login information	S. Järvinen

Table 1: Revision history





2 About this document

This document describes the design details of the PEPSI spectrograph that are relevant for planning the observations. It also describes in detail how the observations are performed.





3 General information

PEPSI had PI instrument status at the LBT until 2020A. If you wish to observe with PEPSI and have questions beyond the usual, please contact either the PI Prof. Dr. Klaus G. Strassmeier at AIP or Mark Wagner at LBTO. PEPSI is operated as a facility instrument since Feb. 1, 2020.

The basic description of PEPSI is given by Strassmeier et al. (2015, AN, 336, 324) and (2018, SPIE, 10702, 12).





4 Planning the observations

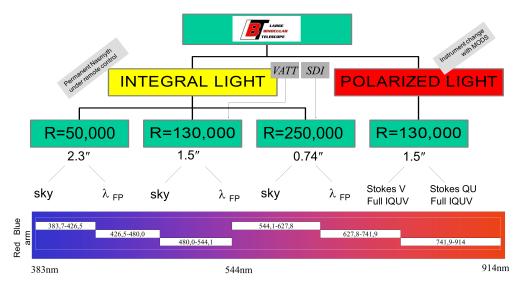


Figure 1: PEPSI observation modes.

4.1 Spectral ranges

The entire spectral range of the PEPSI is from 383 to 912 nm but it **can not** be covered by a single exposure (see, Fig.1 for more details). PEPSI has two arms, blue and red, that cover spectral ranges 383-544 nm and 544-912 nm, respectively. Each arm has three cross-dispersers:

- CD1 383-426 nm in blue arm
- $\bullet~{\rm CD2}$ 426-480 nm in blue arm
- $\bullet~$ CD3 480-544 nm in blue arm
- $\bullet~{\rm CD4}$ 544-627 nm in red arm
- CD5 627-741 nm in red arm
- CD6 741-912 nm in red arm

Simultaneously, one can observe one wavelength region in blue and one in red, however, CDs 3 and 4 can not be used at the same time.





4.2 Resolution modes

Observations can be done using three different fibers, that is with three different resolutions:

- 100 μ m gives R=250,000
- 200 μ m gives R=130,000
- 300 μ m gives R=50,000

4.3 Exposure times

Exposure time depends on the target, the wanted resolution, and used cross-disperser. Exposure times can be estimated using the exposure time calculator that is available on PEPSI web page.

One can have different exposure times and numbers of exposures for cross-dispersers in blue and in red arm (examples below):

- 30 min in blue, 20 min in red \leftarrow red is idle for 10 minutes
- 30 min in blue, 2×15 min in red \Leftarrow both are ready around the same time
- 3×10 min in blue, 6×5 min in red ⇐ both are ready around the same time, blue likely idle for some minutes due to read-out times (80 sec / read-out)





5 Executing the observations

5.1 Accessing PEPSI Graphical User Interface (GUI)

Observations can be executed either using the PEPSI 4K monitors in the LBT control room or one can observe remotely.

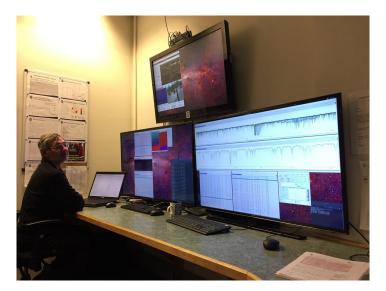


Figure 2: PEPSI computer screens at LBT control room.

In case of remote observing (**NOTE** that you must request SSH and VPN access to LBTO beforehand via this form: Google Form) from Linux machine

- take VNC connection by typing in terminal vncviewer -via USERNAME@ssh.lbto.org -shared 192.168.164.14:
- environment (telemetry, see Sect. 7) status can be seen at 192.168.164.14:2
- passwd is given on need to know basis
- in the end, close the connection from the upper corner 'x'

from Mac

- $\bullet\,$ one has to first make a ${\bf VPN}$ connection vpn.lbto.org
- username and passwd are given on need to know basis
- and then take a VNC (with TigerVNCViewer) connection to server alpha.pepsi.lbto.org:1 (or :2)
- in the end, close the connection with Fn+F8, exit viewer and disconnect VPN





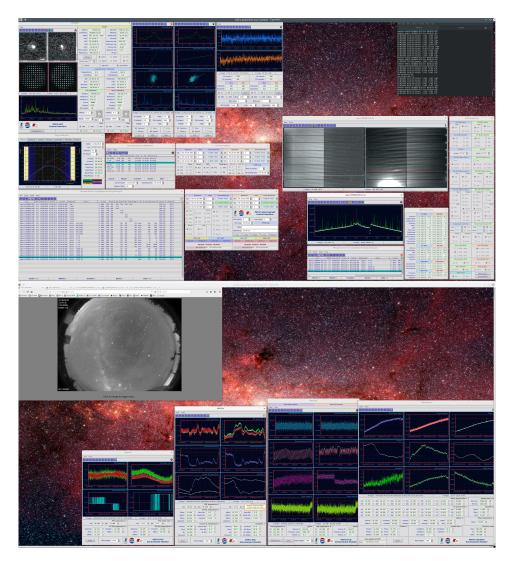


Figure 3: *Top*: VNC view of the user interface (:1). *Bottom*: VNC view of the telemetry (:2).

The PEPSI user interface program should be kept running all the time.

If it is not running, click Activities in the left upper corner. You should get a menu having PEPSI logo. Click on that logo to open the program. Alternatively one can use a terminal to open it (if no terminals open, open a new one). On **pepsi@alpha** type 'pepsi'.

5.2 Connecting with PFU

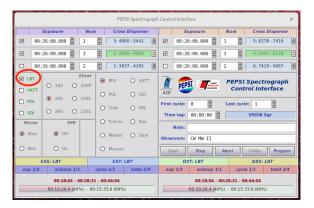
- 1. Now you should have '**PEPSI Spectrograph Control Interface**' open.
 - In case PEPSI has been used for solar observations (SDI selected) and you have text 'Waiting for Sun' in the 'PEPSI Spectrograph Control Interface', click 'Abort' to be able to start night observations.





				PEPS	l Spect	trograph	Contr	ol Inter	face				×
	Exposure	N	um	Cross I	Disper	rser		E	xposure	Num	Cross	Disperser	
№ 00:	26:00.000	1	* *	3: 4800	0 - 544	1 \$	M	00:2	6:00.000 🚔	1	5: 62	78 - 7419	\$
00:	26:00.000 🚔	3	*	2: 426	5 - 480	0	M	00:2	6:00.000 🚔	3	4: 54	41-6278	¢
00:	26:00.000	2	*	1: 383	7 - 426	5 🗘		00:2	6:00.000	2	6: 74	19 - 9067	\$
LBT	O 100 C	Slice 2008	۲	PFU	0 v	/ATT		PEP			Spect	rograph erface	
VATT POL	■ POL								0	Last cyc			_
SDI	O 300 C) 1301	-	ThAr	OF			e lag:			V5558		
Mirror	FPE Off		0	Traces	Ŭ	lat		Note:					
Interest Bille	Un Off		0	Master	0 0	Dark	Obse	rvers:	CW MW II				
O Red	O Red O On O Manual							art	Stop	Abort	Calibs	Program	n
5	SXS: LBT SXT: LBT							D	XT: LBT		DXS:	LBT	
exp 1/3	exp 1/3 subexp 1/1 cycle 1/1 total 2/4								subexp 1/	1 сус	le 1/1	total 2/4	-
	00:18:04 - 00:10:26.4 (4							_	00:18:04 - (00:10:26.4 (40			6)	

 $\bullet\,$ Click on LBT check button to connect and open 'PEPSI@LBT':



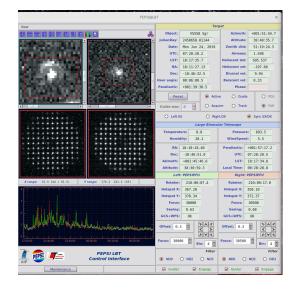
• Check that PFU radio button is selected:

			PEP	SI Spectrograpi	n Contr	ol Interf	ace			×
1	Exposure	Num	Cross	Disperser		Ex	posure	Num	Cross	Disperser
₩ 00:3	26:00.000	1	3: 480	00 - 5441 🗘	V	00:26	:00.000	1	5: 62	78 - 7419 🔹
☑ 00:3	26:00.000	3	2:426	65 - 4800 🗘	V	00:26	:00.000	3 🗳	4: 54	41 - 6278 🚦
00:2	26:00.000	2	1: 383	37 - 4265 🗘		00:26	:00.000	2	6: 74	19 - 9067 😫
LBT		200P	PFU	O VATT		PEPS	i //		Spect	rograph
D VATT	● 200 O	100L	POL	O SDI	AIP	cycle:	_	Last cyc		enace
🗆 SDI	O 300 O	130L	-	O FPE		e lag:	00:00:00		V5558	
Mirror	FPE			O Flat		Note:				
Blue	Off	0) Master	O Dark	Obse	rvers:	CW MW II			
O Red	O On	0	Manual		St	art	Stop	Abort	Calibs	Program
s	XS: LBT		SXT: I	.BT		DX	T: LBT		DXS:	LBT
exp 1/3	subexp 1/1	cyc	ie 1/1	total 2/4	ex	o 1/3	subexp 1/1	1 сус	le 1/1	total 2/4
	00:18:04 - 00 00:10:26.4 (40%						00:18:04 - 0			5)

2. A 'PEPSI@LBT' window should appear:







5.3 Selecting and sending targets to LBT

1. Click 'Program' button on 'PEPSI Spectrograph Control Interface':

						PEP:	SI Spectrog	raph	Contr	ol Inter	face					×
		Exposure		Nu	n	Cross	Disperser			E	xposure	N	lum	Cros	s Disperse	n
M	00:	26:00.000	< >	1	< >	3: 480	0 - 5441	\$	V	00:2	6:00.000	1	4 >	5: 63	278 - 7419	\$
V	00:	26:00.000	< >	3	* >	2:426	5 - 4800	\$		00:2	6:00.000	3	4 >	4:54	441 - 6278	¢
	00:	26:00.000	< >	2	*	1: 383	7 - 4265	\$		00:2	6:00.000	2	4 b	6: 7	\$19 - 9067	\$
-	вт	O 100	0	200P	۲	PFU	O VATT			PEP	SI ///				trograp terface	h
	POL O 200 O 100L O POL O SDI								AIP First	cycle:	0	L	ast cycl	le: 1	4	_
	DI	O 300	_	130L	0	ThAr	O FPE		Tim	e lag:	00:00:00	*		V5558		
Мі • Е	nor Blue	 Off 	FPE		0	Traces Master	O Flat			Note: rvers:	CW MW II					
OF	O Red O On O Manual									art	Stop	Abo	ort	Calibs	Progra	m
	SXS: LBT SXT: LBT									D	XT: LBT			DXS	LBT	
exp	xp 1/3 subexp 1/1 cycle 1/1 total 2/4									1/3	subexp	1/1	cycl	le 1/1	total 2	/4
	00:18:04 - 00:28:31 - 00:44:04 00:10:26:4 (40%) - 00:15:33.6 (60%)									_	00:18:04 00:10:26.4 (4				56)	

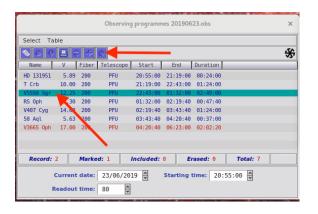
- 2. When you
 - a) **already have an observing program**, a 'Observing Programmes' window and a 'Target Visibility Plot' window opens. If not, go to 'Table' menu, choose 'Open or Close Table' and select the correct one.

NS 0pril 11.30 200 PU 01.212/00 00/212/00 00/212/00 00/212/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00 02/213/00	Observing programmes 20190623.obs	×				Target Visibi	lity Plot			×
Nome V Fiber Each Control Date 20/06/2013 Nome V Fiber Telescope Start End Duration 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0 10/0		Altitude	Parallactic	Azimuth	Airmass	DiumalVel	MoonDist	Phases		
Record: 2 Marked: 1 Included: 0 Erased: 0 Total: 7 10 10 10 10 10 10 10 10 10 10 10 10 10	None V Filter Telescope Start End Duration 10 131951 5.09 200 PFU 20:55:00 21:19:00 00:24:00 17 crb 10.06 200 PFU 21:19:00 22:43:00 01:24:00 Noses 12 200 PFU 21:19:00 21:19:40 01:24:00 V407 Cycy 14:66 200 PFU 02:19:40 03:43:00 01:24:00 Se AqL 5.53 200 PFU 02:34:30:40 01:24:00 01:24:00	90 00 90 00 90 90 90 90 90 90 90 90 90 90 90 90 9	0 14:00 15:00		0 18:00 19:			1.00 Alimense 1.02 mess 1.06 1.15 1.30 1.55 1.99	Last: 23 Attitude: 25 UT offset: -7 Sunset: Sunrise: NightTime: GrayTime: DarkTime:	/06/2019
Readout time: 80	Current date: 23/06/2019 🖗 Starting time: 20:55:00 🛱	20	20.00 21.00	22:00 23:00	00:00 01:00	0 02:00 03:00		5.60	MoonPhase:	T Crk 1407 Cyg





- If GUI had to be restarted, check that the correct program is open (YYYYMMDD.obs)!
- select the target (highlighted with teal color) you want to observe and send it to LBT. This does not yet move the telescope! Note that target can be sent already during CCD readout!



• check that 'PEPSI@LBT' has the same target as you chose, or resend, and check that 'PEPSI Spectrograph Control Interface' changed (target name, selected cross-dispersers, exposure time, etc.) according to selected target. Note that the changes happen only after CCD readout has finished.

PEPSIQU	BT ×		
View	Target		
	Object: V5558 Sgr Azimuth: +001:51:44.7		
	JulianDay. 1456550701144 Altitude: 38:40:35.7 Date: Mon Jun 24, 2819 Zenith dist: 51:19:24.3		
	UTC: 07:28:28.2 Airmass: 1,598		
	LST: 18:17:35.7 Hellocent del: 505.537		
	RA: 18:11:27.13 Hellocent vel: -197.60		
	Dec: -18:46:32.5 Diurnal vel: 9.94		
	Hour angle: 00:06:08.5 Barycent vel: 0.33		
	Parallactic: +001:39:30.5 Phase:		
Anna and a second second	Preset Active Guide POS	PEPSI Spectrograph	Control Interface X
	Guide star: 0 0 Acquire O Track @ PAR	Exposure num Cross Disperser	Exposure Trons Cross Disperser
	O Left SX O Right DX 📀 Sync SX/DX	00:26:00.000 🛱 1 💭 3:4800-5441 🕏	00:26:00.000 1 5:0028-7419
	Large Binocular Telescope	00:26:00.000 🗘 3 🗘 2:4265-4800 🔃	00:26:00.000 🛱 3 🛱 4:5441-6278 🖶
	Temperature: 8.8 Pressure: 693.5	00:20:00.000 - 5 - 2:4205-4800 -	00:26:00.000 🛱 3 🖨 4:5441-6275
	Humidity: 28.1 WindSpeed: 5.5	00:26:00.000 🗘 2 🗘 1:3837-4265 🕏	00:26:00.000 2 6:7419-9067
	RA: 18:10:18.40 Parallactic: +001:57:17.2		
Contraction Contractions	Dec: -18:46:51.0 UTC: 07:28:28.5	LBT Slicer PFU O VATT	
	Azimuth: +001:45:46.6 LST: 18:17:34.8	O 100 O 200P	PEPSI Spectrograph
	Altitude: 38:30:59.3 Local Time: 00:28:28.8	VATT O POL O SDI	AIP Control Interface
	Left: PEPSIPFU Right: PEPSIPFU	0 200 O 100L	
Xrange: 52.5 144 (91.5) Yrange: 176.2 241.2 (65)	Rotator: 210:00:07.4 Rotator: 210:00:17.0	O That O EDE	First cycle: 0 A Last cycle: 1 A
	Hotspot X: 367.28 Hotspot X: 350.10	SDI Q 300 O 130L	Time lag: 00:00:00 🚔 V5558 gr
	Hotspot Y: 370,34 Hotspot Y: 372,37	Mirror O Traces O Flat	
3	Focus: 30000 Focus: 30500	Million Provide Contract	Note:
	Seeing: 0.63 Seeing: 0.68	Blue Off Master O Dark	
	GCS+WFS: 0K GCS+WFS: 0K		Observers: CW MW II
· Hund Part " Start Martha Andrew Start - Start Barrows	Offset: 0.3 1 ► A7 Offset: 0.3 1 ► A7	O Red O On O Manual	Start Stop Abort Calibs Program
	EV4 EV4	SXS: LBT SXT: LBT	DXT: LBT DXS: LBT
23:30:00 23:40:00 23:50:00 00:00:00 00:10:00 00:20:00	Focus: 30000 Bin: 4 Focus: 30500 Bin: 4 F	exp 1/3 subexp 1/1 cycle 1/1 total 2/4	exp 1/3 subexp 1/1 cycle 1/1 total 2/4
D 💏 🛲 PEPSI LBT	Filter Filter		
PEPSI LBT Control Interface	● ND0 ○ ND2 ○ ND3 ● ND0 ○ ND2 ○ ND3	00:18:04 - 00:28:31 - 00:44:04	00:18:04 - 00:28:31 - 00:44:04
AIP -		00:10:26.4 (40%) - 00:15:33.6 (60%)	00:10:26.4 (40%) - 00:15:33.6 (60%)
Maintenance	🗹 Gulder 🗹 Engage 🗹 Gulder 🗹 Engage		

• if you need to change pre-defined exposure times, click 'Edit fields' and a new window pops up and you can make the changes. Note that values in 'PEPSI Spectrograph Control Interface' do not change unless you send the target information again (see A.) You can also change values in 'PEPSI Spectrograph Control Interface' directly, but then the visibility





plot does not change and block will not remember the changes made in future.

Observing programmes 20190623.obs X		
Select Table		
V Fiber Telescope Start End Duration H131951 5.89 200 PFU 20:55:00 21:19:00 00:24:00	Edit Observing Block	×
T rb 10.00 200 PFU 21:19:00 22:43:00 01:24:00 VS 88 Sqr 12.25 200 PFU 22:43:00 01:32:00 02:49:00	Exposure Num Cross Disperser Exposure Num Cross Disper	ser
RS uph 11.30 200 PFU 01:32:00 02:19:40 00:47:40 V40 Cva 14.68 200 PFU 02:19:40 03:43:40 01:24:00	•••••••••••••••••••••••••	8 🗘
58 Au 5.63 200 PFU 03:43:40 04:20:40 00:37:00 V366 0ph 17.00 200 PFU 04:20:40 06:23:00 02:02:20	Ø0:26:00.000 ₩ 3 ₩ 3:4800-5441 ♥ Ø0:26:00.000 ₩ 3 ₩ 5:6278-741	9 🗘
	00:26:00.000 x 2 x 1:3837-4265 x 00:26:00.000 x 2 x 6:7419-906	7 🗘
Record: 2 Marked: 1 Included: 0 Erased: 0 Total: 7 Current date: 23/06/2019 Starting time: 20:55:00 Starting time: 20:55:00 Starting time: Starting time: 20:55:00 Starting time: Starting tim: Starting tim: Start	Sileer Mirror FPE Telescope POL SX POL DX V5558 Sgr 0 100 0 200P Image: Blue in the state in the	
Readout time: 80	O 300 O 130L O Red O On O POL O SDI O QUV Overhead time: 00:05	:00 🗳

b) don't have any targets or you want to change targets

- See Section 4 for additional information!
- click 'add another object' in 'Observing programmes' window and a new window having targets pops up

		Observing	g programme	s 201906	23.obs	×	Obser	ving targets in /	'home/pepsi/ses/p	epsi/PEPSI/objec	cts.tab	×
Select Tat	hle					1	File Table Select Vi	ew				
						-	Σ 🖹 占 💹 Σ 📎	S 2 C				
📎 습 🖓	\ominus \Diamond \checkmark					*	Name	V	Spectrum	Туре	RA	De
Name	V Fi	Telescope	Start	End	Duration		Alpha Aur	0.08	G1III+K0III		05:16:41.36	+45;
HD 131951	5.89 200	PFU	20:55:00	21.10.00	00:24:00		Alpha Cyg	1.25	A2Iae		20:41:25.92	+45:
				Contraction of the local sector			TZ Tri	4.95	G0III+G5III		02:12:22.28	+30:
T Crb	10.00 200	PFU	21:19:00	22:43:00	01:24:00		UX Ari	6.37	KOIV	RSCVn	03:26:35.39	+28:
V5558 Sgr	12.25 200	PFU	22:43:00	01:32:00	02:49:00		51 Peg	5.46	G2.5IVa	planet	22:57:27.98	+20:
RS Oph	11.30 200	PFU	01:32:00	02:19:40	00:47:40		HR 718	4.30	B9III	Solar	02:28:09.54	+08:
V407 Cyg	14.68 200	PFU	02:19:40	03.43.40	01:24:00		HR 153	3.66	B2IV	Solar	00:36:58.28	+53:
							HR 3454	4.30	B3V	Solar	08:43:13.47	+03:
58 Aql	5.63 200	PFU	03:43:40				EK Dra	7.61	G1.5V	BYDra	14:39:00.22	+64:
V3665 Oph	17.00 200	PFU	04:20:40	06:23:00	02:02:20		II Peg	7.20	KOV	RSCVn	23:55:04.05	+28:
							HD 194937	6.23	G9III		20:28:07.54	+08:
							Theta01 Ori C	5.13	07V		05:35:16.46	-05:
							Beta Tau	1.65	B7III		05:26:17.51	+28:
Record:	2 Mark	ed: 1	Included: 0	Er	ased: 0 Total: 7		HR 1544	4.35	A1Vn	Solar	04:50:36.72	+08:
	-						24 Tau	6.28	AOV	Pleiades	03:47:21.04	+24:
	Current date	23/06/20	19 🌲 S	itarting 1	ime: 20:55:00 🚔		WASP 8	9.87	G6	TEP	23:59:36.07	- 35 :
	eadout time						<u>د</u>					
	cuuout time	. 00 🖉					Record: 0 Marke	d: 14 In	cluded: 0	Erased: 0	Total: 1635	

• choose the target and send it to the observing block

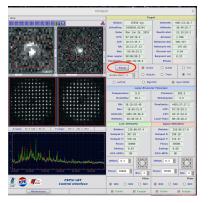
File Table Sel	ect View					
X 😫 🕹 👿	Σ 🔊 🛇 2	2	—	_		
Name	V	Ī	Spectrum	Туре	RA	De
Alpha Aur	8.1	8	G1III+K0III		05:16:41.36	+45;
Alpha Cyg	1.3	25	A2Iae		20:41:25.92	+45:
TZ Tri	4.1	95	G0III+G5III		02:12:22.28	+30:
UX Ari	6.3	87	KOIV	RSCVn	03:26:35.39	+28:
51 Peg	5.4	6	G2.5IVa	planet	22:57:27.98	+20:
HR 718	4.3	80	B9III	Solar	02:28:09.54	+08:
HR 153	3.1	6	B2IV	Solar	00:36:58.28	+53:
HR 3454	4.3	80	B3V	Solar	08:43:13.47	+03:
EK Dra	7.1	51	G1.5V	BYDra	14:39:00.22	+64:
II Peg	7.3	20	KOV	RSCVn	23:55:04.05	+28:
HD 194937	6.3	23	G9III		20:28:07.54	+08:
Theta01 Ori C	5.0	13	07V		05:35:16.46	-05:
Beta Tau	1.0	55	B7III		05:26:17.51	+28:
HR 1544	4.3	85	A1Vn	Solar	04:50:36.72	+08:
24 Tau	6.3	28	AOV	Pleiades	03:47:21.04	+24:
WASP 8	9.1	37	G6	TEP	23:59:36.07	-35:

• continue as in 2-a.

3. after the telescope operator gives the permission, click 'PRESET'





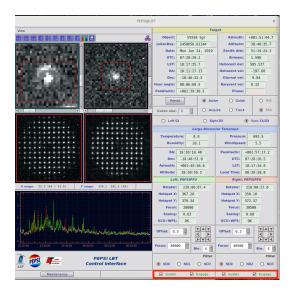


- 'PRESET' to next target can be done already during CCD readout.
- Note that 'Preset' can be done in four different modes, but only the first one should be used unless requested otherwise by the telescope operator:
 - Active the normal mode, uses wavefront sensor and guiding
 - Guide no wavefront sensor is used, guiding yes
 - Acquire only points and centres on hot spot
 - Track only points

5.4 Guiding

Guiding (and also focusing) is done by the telescope operator. Do not do anything unless asked.

• 'Engage' opens the hatches so that the telescope operator can put the star in the position.







5.5 Observing

Start observations by clicking 'Start' in 'PEPSI Spectrograph Control Interface':

			PEP	SI Spectrograph	Control Interface		×
	Exposure	Nun	n Cross	Disperser	Exposure	Num Cross	Disperser
№ 00:	26:00.000	1	3: 480	00 - 5441 🗘	00:26:00.000	1 5:62	78 - 7419 🗘
00:	26:00.000	3	2:426	5 - 4800 🗘	00:26:00.000	3 4: 544	41 - 6278 🗘
00:	26:00.000	2	1: 383	37 - 4265 🗘	00:26:00.000	2 🗧 6: 74	19 - 9067 🗘
LBT	O 100 O	5//cer 200P	PFU	O VATT		PEPSI Spect	
	 200 	100L	O POL	O SDI	AIP First cycle: 0	Last cycle: 1	*
🗆 SDI		130L	O ThAr	O FPE	Time lag: 00:00:00	V5558 :	
Mirror Blue	Off		O Traces	O Flat	Note:		
U Diue	Un Un		O Master	O Dark	Observers: CW MW II		
O Red	O On		O Manual	(Start Stop	Abort Calibs	Program
4	5XS: LBT		SXT: I	.BT	DXT: LBT	DXS:	LBT
exp 1/3	subexp 1/2	1	cycle 1/1	total 2/4	exp 1/3 subexp 1/1	cycle 1/1	total 2/4
	00:18:04 - (00:10:26.4 (40					0:28:31 - 00:44:04 %) - 00:15:33.6 (60%)

If the exposure needs to be interrupted for any reason, use

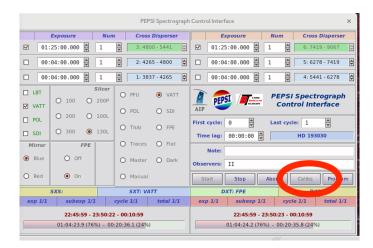
- 'Stop' in case you want to save the data obtained so far
- $\bullet\,$ 'Abort' in case the exposure time was not long enough for useful data

5.6 Calibration frames

After the observing night is over, it is time to take the calibration frames. Check that you have stopped guiding and guider camera is on pause.

In the 'PEPSI Spectrograph Control Interface' window:

1. Click 'Calibs' button to get a pop-up window:

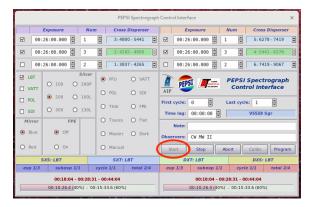






		Ca	libration Seque	ncer		×
ThAr	□ 100	200	300	🗖 200P	☑ 100L	☑ 130L
FPE	100	200	300	🗌 200P	☑ 100L	☑ 130L
Traces	100	200	300	🗖 200P	☑ 100L	☑ 130L
Flat	100	200	300	200P	🗌 100L	🗌 130L
Master	100	200	300	🗖 200P	🗖 100L	🗌 130L
Dark	🗌 any					

- 2. Check that for wanted fiber(s) ThAr, FPE, and Traces are chosen
- 3. Click 'START' button on Control Interface window:



4. When calibration frames are ready, click 'Calibs' again to close the calibration sequencer window and to be able to do anything else.





6 Raw data

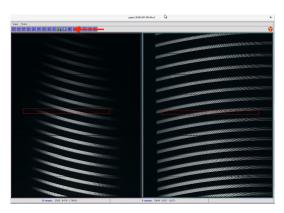
6.1 Viewing obtained spectra

It is good to take a look at the spectra in order to see if you should change exposure times etc.

1. Select the spectrum (highlighted with teal colour) you want to look at from 'FITS Image Browser' with Enter or click the arrow icon to send it to 'Spectrum viewer'. One can also look at multiple spectra by selecting them and clicking double arrow icon.

						FITS	lmage Browser o	n pepsi@alpI	ha:/hom	e/pepsi/data/pepsi/					
le Select Table	Tools														
	2 6														
File		Date-obs	UT-obs	Exptine	Inagetyp	Object	Crosdis	Eiber SYS	I syr I	DXT DXS SXRET DXRE	T I SVEDS I DVEDS I SNR	Dhase	PID No	te Charave	Fielens Mirror
or (b. 20100525, 017	fite	25/05/2019	23-43-08 5	00-00-10-000	2000	object	1: 3837 - 4265	130	Thác	Thân	1 34103 54103 344	Thuse	140 100	2103 527	Rive
psib.20190525.018	fits	25/05/2019	23:44:58.6	00:00:10.000	etalon		3: 4800 - 5441	130L	FPE	FPE				2075.118	Red
psir.20190525.020					etalon		5: 6278 - 7419	130L	FPE	FPE				2055.110	Red
psir.20190525.021	fits	25/05/2019	23:46:58.7	00:00:07.000	etalon		6: 7419 - 9067	130L	FPE	FPE				2047.214	Red
psib.20190525.019	fits	25/05/2019	23:48:45.9	00:00:00.120	traces		3: 4800 - 5441	130L	Flat					2074.994	Red
psir.20190525.022	fits	25/05/2019	23:48:45.9	00:00:00.035	traces		5: 6278 - 7419	130L	Flat					2054.987	Red
psib.20190525.020	fits	25/05/2019	23:50:28.5	00:00:00.120	traces		3: 4800 - 5441	130L		Flat				2075.216	Red
psir.20190525.023	fits	25/05/2019	23:50:28.6	00:00:00.035	traces		5: 6278 - 7419	130L		Flat				2055.206	Red
psir.20190525.024	fits	25/05/2019	23:52:11.1	00:00:00.020	traces		4: 5441 - 6278	130L	Flat					2063.911	Blue
osib.20190525.021	fits	25/05/2019	23:52:11.2	00:00:00.300	traces		2: 4265 - 4806	130L	Flat					2687.591	Blue
osib.20190525.022	fits	25/05/2019	23:53:54.0	00:00:00.300	traces		2: 4265 - 4800	130L		Flat				2088.017	Blue
osir.20190525.025	fits	25/05/2019	23:53:54.0	00:00:00.020	traces		4: 5441 - 6278	130L		Flat				2064.332	Blue
sib.20190525.023	fits	25/05/2019	23:55:37.1	00:00:00.300	traces		2: 4265 - 4886	130L	Flat					2087.725	Red
sib.20190525.024	fits	25/05/2019	23:57:17.8	00:00:00.300	traces		2: 4265 - 4800	130L		Flat				2087.966	Red
sib.20190525.025	fits	25/05/2019	23:58:58.4	00:00:01.000	traces		1: 3837 - 4265	130L	Flat					2103.169	Red
osir.20190525.026	fits	25/05/2019	23:58:58.4	00:00:00.055	traces		6: 7419 - 9067	130L	Flat					2047.274	Red
s1b.20190526.000	fits	26/05/2019	60:00:40.9	00:00:01.000	traces		1: 3837 - 4265	130L		Flat				2102.938	Red
sir.20190526.000	fits	26/05/2019	00:00:40.9	00:00:00.055	traces		6: 7419 - 9867	130L		Flat				2047.052	Red
osib.20190526.001	fits	26/05/2019	00:02:23.7	00:00:01.000	traces		1: 3837 - 4265	130L	Flat					2103.190	Blue
osib.20190526.002	fits	26/05/2019	00:04:04.7	00:00:01.000	traces		1: 3837 - 4265	130L		Flat				2103.477	Blue
psib.20190526.003	fits	26/05/2019	03:07:06.7	01:25:00.000	object	HD 142124	3: 4800 - 5441	130L	VATT	FPE	8	6	tess	2075.304	Red
osir.20190526.001	fits	26/05/2019	03:07:06.7	01:25:00.000	object	HD 142124	5: 6278 - 7419	130L	VATT	FPE	16	2	tess	2055.294	Red
osib.20190526.004	fits	26/05/2019	04:34:54.8	01:25:00.000	object	HD 143252	3: 4800 - 5441	130L	VATT	FPE	5	7	tess	2075.894	Red
osir.20190526.002	fits	26/05/2019	04:34:54.8	01:25:00.000	object	HD 143252	5: 6278 - 7419	130L	VATT	FPE	14	2	tess	2055.877	Red
osib.20190526.005	fits	26/05/2019	06:02:16.4	01:10:00.000	object	HD 187748	3: 4800 - 5441	130L	VATT	FPE	15	3	tessl	2075.323	Red
psir.20190526.003	fits	26/05/2019	06:02:16.4	01:10:00.000	object	HD 187748	6: 7419 - 9067	130L	VATT	FPE	31	1	tessl	2047.625	Red
osib.20190526.006	fits	26/05/2019	07:15:30.7	01:25:00.000	object	HD 189207	3: 4800 - 5441	130L	VATT	FPE	9	2	tessl	2075.997	Red
psir.20190526.004	fits	26/05/2019	07:15:30.7	01:25:00.000	object	HD 189207	6: 7419 - 9067	130L	VATT	FPE	14	8	tessl	2048.289	Red
sib.20190526.007	fits	26/05/2019	08:42:58.8	01:15:00.000	object	HD 185497	3: 4800 - 5441	130L	VATT	FPE	11	5	tess1	2076.277	Red
psir.20190526.005	fits	26/05/2019	68:42:58.8	01:15:00.000	object	HD 185497	6: 7419 - 9867	130L	VATT		17		tessl	2048.569	Red
psib.20190526.008	fits	26/05/2019	10:00:29.7	01:34:59.223	object	HD 190695	3: 4800 - 5441	130L	VATT	FPE	7	9	tessl	2076.163	Red
psir.20190526.006	fits	26/05/2019	10:00:29.7	01:34:59.237	object	HD 190695	6: 7419 - 9867	130L	VATT		14		tessl	2048.454	Red
sib.20190527.000						HD 143077			VATT		7		tess	2075.593	Red
psir.20190527.000	fits	27/05/2019	03:06:36.8	01:25:00.000	object	HD 143077	5: 6278 - 7419	130L	VATT		15		tess	2055.587	Red
psir.20190527.001	fits	27/05/2019	04:33:57.1	01:10:00.000	object	HR 7247	6: 7419 - 9867	130L	VATT		27		tessl	2047.454	Red
osib.20190527.001	fits	27/05/2019	04:33:57.2	01:10:00.000	object	HR 7247	3: 4800 - 5441	130L	VATT	FPE	16	6	tessl	2075.140	Red
						1		111	1						
Record:	65			Marked: 0			Included: 0			Erased: 0		Total:	101		

2. The active window in 'Spectrum viewer' has a cyan frame. Select the area you want to look at closer by drawing a red box with, for example, a mouse. To see a summed spectrum from selected area Press 'Enter', or Click the normal 'Sigma' icon (one dimensional cross-cut in horizontal direction) on top of the viewer (the other sigma makes it in vertical direction)



3. Now you have a spectrum plot where you can see the ADUs:

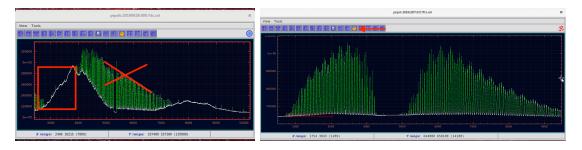






6.2 Estimating signal-to-noise ratio

1. Select an area with mouse from highest continuum values to lowest (don't be distracted by high fabry-perot peaks) and click 'Sun' icon on top of the spectrum viewer:



2. You get a pop-up window there the S/N estimate is given, save that information into fits list by clicking 'Save':

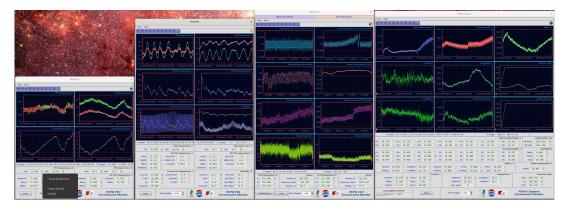
	Signal/	Noise
	FITS keyword	CCD gain 🛨
	GAIN	0.5
13		
	Estimated	signal/noise ratio: 559





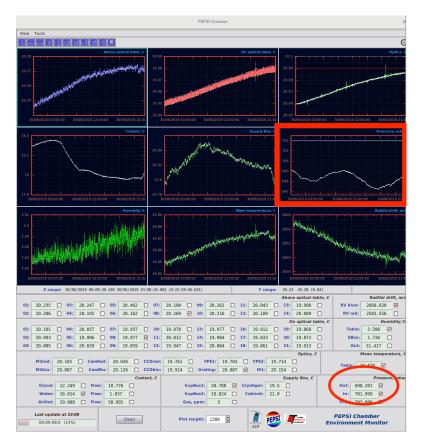
7 Telemetry

It is essential to **check the telemetry** from time to time:



If something is wrong and you are not trained to fix the problem, contact a person who is!

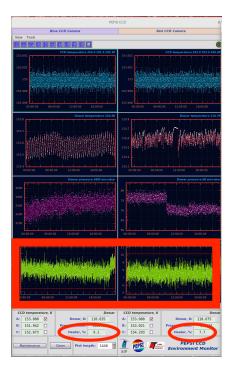
The most important is the 'Pressure' in **PEPSI Chamber** window. If 'In' value has red background, and one sees that pressure curves follow each others, everything is not fine.







Other important measure is 'Dewar heater' in PEPSI CCD window. If it approaches 0, the dewar pressure rises and pumping is needed.







8 Troubleshooting

Sometimes the software program freezes or even crashes (STA Archon time out). If that happens, find the following terminal

	Terminal		×
File Edit View Search Terminal Tabs Help			
Terminal ×		Æ	-
Compress pepsib.20190629.088.fits 00:00:26.771 Compress pepsib.20190629.089.fits 00:00:28.799 Compress pepsir.20190629.083.fits 00:00:27.329 Compress pepsib.20190629.084.fits 00:00:24.828 Compress pepsib.20190629.090.fits 00:00:29.887 29/06/2019 15:37.47 Blue Archon 29/06/2019 15: 29/06/2019 15:37.45 Connection refused in connect "Cought signal 2: Interrupt Cought signal 2: Interrupt Cought signal 2: Interrupt Cought signal 2: Interrupt Cought signal 2: Interrupt	37:49 Red Archon Timeout in starting of imag		
[pepsi@alpha -]# pepsi Read FITS Headers time 00:00:03.268 in 8 threads Part Readers time 00:00:04.050 in 8 threads blu 192.168.164.30:5000 Cryocon,Model 24C,203437, red 192.168.164.30:5002 Cryo-con,24C,203430,3.222 10.0.2.22:42336 -> 10.0.2.2:4242 STA Archon (X12- 7Ccought signal 2: Interrupt Cought signal 2: Interrupt Cought signal 2: Interrupt Cought signal 2: Interrupt Cought signal 2: Interrupt	B B -F 1.0.1028) Blue uploaded pepsiblue_100KHz.acf		
[pepsi@alpha ~]# pepsi Read FITS Headers time 00:00:02.195 in 8 threads Read FITS Headers time 00:00:03.949 in 8 threads blu 192.168.164.31:5000 Cryocon,Model 24C,204437, red 192.168.164.30:5002 Cryo-con,24C,203430,3.22 10.0.2.225:9118 -> 10.0.2.2:4242 STA Archon (X12- 10.0.1.11:41772 -> 10.0.1.1:4242 STA Archon (X12-	B B -F 1.0.1028) Blue uploaded pepsiblue_100KHz.acf		

and type Ctrl+c and start all over again.

If terminal gives 'Lost connection with Camera', one can go to 'PEPSI Control Unit' Maintenance, but in order to do that, **you should know what you are doing**.